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PATENT ABSTRACTS OF JAPAN

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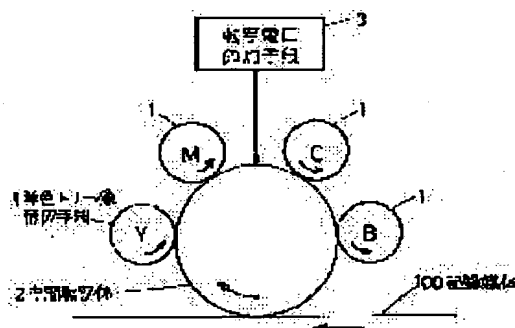
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(54) COLOR ELECTROPHOTOGRAPHIC DEVICE

(57)Abstract:

PURPOSE: To obtain a color image excellent in color reproducibility and having high quality on a recording medium even when a part of toner in a lowermost layer is left on an intermediate transfer body by controlling transfer voltage.

CONSTITUTION: When it is assumed that the ratio of the toner amount of a toner image transferred on the intermediate transfer body 2 to the toner amount of the toner image formed in a monochrome toner image forming means 1 is defined as 'transfer efficiency', impressed voltage by a transfer voltage impressing means 3 is set so that the transfer efficiency of the monochrome toner layer being the lowermost layer which directly adheres to the transfer body 2 may be larger than the transfer efficiency of the monochrome toner layer other than the lowermost layer. Therefore, the toner image is transferred on the monochrome toner layer being the lowermost layer from the monochrome toner image forming means 1 with higher transfer efficiency than that of other layer no matter whatever toner layer is the lowermost layer on the transfer body 2 among the plural monochrome toner layers. As a result, the toner amount only of the toner layer being the lowermost layer always becomes excessive in comparison with the other layer on the transfer body 2, and becomes more appropriate than the other layer in the case that it is transferred on a recording medium 100.



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CLAIMS

[Claim(s)]

[Claim 1] Two or more monochrome toner image formation means to form a monochromatic toner image respectively with a toner of a mutually different color (1) A middle imprint object which each monochrome toner image piles up, is imprinted from each above-mentioned monochrome toner image formation means (1), and imprints the piled-up toner image to a record medium (100) further (2) An imprint voltage impression means for impressing imprint voltage to the above-mentioned middle imprint object (2), in order to make the above-mentioned middle imprint object (2) imprint each monochrome toner image from each above-mentioned monochrome toner image formation means (1) (3) When a ratio of the amount of toners of a toner image imprinted by the above-mentioned middle imprint object (2) over the amount of toners of a toner image which is color electrophotography equipment equipped with the above, and was formed in the above-mentioned monochrome toner image formation means (1) is made into "imprint effectiveness", It is characterized by setting up applied voltage by the above-mentioned imprint voltage impression means (3) so that imprint effectiveness of a monochrome toner layer of the lowest layer which adheres to the above-mentioned middle imprint object (2) directly may become larger than imprint effectiveness of monochrome toner layers other than the above-mentioned lowest layer.

[Claim 2] A surface portion of the above-mentioned middle imprint object (2) is color electrophotography equipment according to claim 1 with which a volume resistivity is formed of a member with the conductivity of $10^8 - 10^{12}$ ohm-cm, and elasticity, and voltage of 600-1200 volts is impressed as the above-mentioned imprint voltage.

[Claim 3] Color electrophotography equipment according to claim 2 whose above-mentioned imprint voltage by the above-mentioned imprint voltage impression means (3) is 800-1000 volts.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] After this invention piles up the monochrome toner image of two or more colors and imprints it on a middle imprint object, it relates to the color electrophotography equipment which imprinted that full color toner image to the record medium further.

[0002] Although what is necessary is to make yellow, a Magenta, and the toner image of the three primary colors of cyanogen, and a total of four black colors pile up mutually, and just to imprint them to a record medium, in order to express a color picture with a toner, since color mixture and a location gap tend to take place, it is not easy to perform such a superposition imprint to a record medium directly from a photo conductor. Then, there are some which imprinted the full color toner image through the middle imprint object.

[0003]

[Description of the Prior Art] In such conventional color electrophotography equipment, first, an image is divided into a dot and the color of the color which it is going to express is separated into four colors of yellow, a Magenta, cyanogen, and black for every dot. And yellow, a Magenta, cyanogen, and a black monochrome toner image are formed in the surface of four photoconductor drums, and each color is piled up, it imprints on a middle imprint object (primary imprint), and, subsequently to a middle imprint object top, the formed full color toner image is imprinted to the record medium (secondary imprint).

[0004]

[Problem(s) to be Solved by the Invention] However, in case a secondary imprint is performed from a middle imprint object to a record medium, a part of the toner adheres to a middle imprint object, and the toner layer of the lowest layer which touches the middle imprint object directly remains on a middle imprint object. Therefore, by the full color toner image on a record medium, the color component of the lowest layer (a record-medium top the maximum upper layer) becomes weak, and an exact color is no longer reproduced.

[0005] In case for example, a monochrome toner image is formed there, in light exposure, it carries out and an increase and a means which increases the amount of toners of the layer are also considered only for the color which becomes the lowest layer on a middle imprint object. However, in order to perform this since it has not become settled which color becomes the lowest layer in case a full color toner image is formed, it is necessary to read the portion which serves as the lowest layer further after color separation, and to record on memory as image information. Therefore, an image memory becomes huge, and control becomes difficult, and also many defects, like the price of equipment becomes high and process speed also becomes slow arise.

[0006] Then, this invention aims at offering the color electrophotography equipment which can obtain the color picture of the good high quality of color reproduction nature on a record medium by the easy configuration, even if some toners of the lowest layer remain in a middle imprint object, in case a full color toner image is imprinted to a record medium.

[0007]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, a middle

imprint object of electrophotography equipment of this invention Two or more monochrome toner image formation means 1 to form a monochromatic toner image respectively with a toner of a mutually different color as shown in drawing 1 , The middle imprint object 2 which each monochrome toner image piles up, is imprinted from each above-mentioned monochrome toner image formation means 1, and imprints the piled-up toner image to a record medium 100 further, [In color electrophotography equipment which established the imprint voltage impression means 3 for impressing imprint voltage to the above-mentioned middle imprint object 2 in order to make the above-mentioned middle imprint object 2 imprint each monochrome toner image from each above-mentioned monochrome toner image formation means 1 When a ratio of the amount of toners of a toner image imprinted by the above-mentioned middle imprint object 2 over the amount of toners of a toner image formed in the above-mentioned monochrome toner image formation means 1 is made into "imprint effectiveness", It is characterized by setting up applied voltage by the above-mentioned imprint voltage impression means 3 so that imprint effectiveness of a monochrome toner layer of the lowest layer which adheres to the above-mentioned middle imprint object 2 directly may become larger than imprint effectiveness of monochrome toner layers other than the above-mentioned lowest layer.

[0008] In addition, a volume resistivity may form a surface portion of the above-mentioned middle imprint object 2 by member with the conductivity of $10^8 \sim 10^{12}$ ohm-cm, and elasticity, and voltage of 600-1200 volts may be impressed as the above-mentioned imprint voltage, and it is still more desirable if the above-mentioned imprint voltage by the above-mentioned imprint voltage impression means 3 is 800-1000 volts.

[0009]

[Function] Even if which toner layer turns into the lowest layer on the middle imprint object 2 among two or more monochrome toner layers, the monochrome toner layer of the lowest layer receives the imprint of a toner image from the monochrome toner image formation means 1 at high imprint effectiveness compared with other layers. Consequently, on the middle imprint object 2, only the toner layer of the lowest layer always serves as the superfluous amount of toners as compared with other layers.

[0010] Therefore, in case a record medium 100 next imprints from the middle imprint object 2, when some toners of the lowest layer remain on the middle imprint object 2, the amount of toners of the lowest layer turns into a suitable amount on a record medium 100 as compared with other layers.

[0011]

[Example] An example is explained with reference to a drawing. Drawing 2 shows the color electrophotography equipment which used the toner of four colors of yellow (Y), a Magenta (M), cyanogen (C), and black (B).

[0012] This equipment has four monochrome toner image formation means 1 (1Y, 1M, 1C, 1B) for forming the toner image by the toner of four colors, and the middle imprint drum 2 by which contacts at coincidence the photoconductor drum 10 (10Y, 10M, 10C, 10B) prepared in each monochrome toner image formation means 1, and a rotation drive is carried out.

[0013] And after piling up and imprinting the toner image of each color on the peripheral face of the middle imprint drum 2 from each photoconductor drum 10 so that it may become the order of yellow (Y), a Magenta (M), cyanogen (C), and black (B) from a lower layer side (primary imprint), the color toner image (full color toner image) is imprinted on the record form 100 from on the middle imprint drum 2 (secondary imprint). Therefore, on the record form 100, the toner image of each color is formed by the reverse order with the middle imprint drum 2 top.

[0014] Around each photoconductor drum 10 (10Y, 10M, 10C, 10B) The sequential array of the front electrification machine 11 for electrifying a photoconductor drum 10, the photographic filter 12 which irradiates image light and forms an electrostatic latent image in a photoconductor drum 10, and the development counter 13 which develops an electrostatic latent image with a toner is carried out. When the middle imprint drum 2 contacts a photoconductor drum 10, the toner image of the photoconductor drum 10 surface is imprinted by the middle imprint drum 2 (primary imprint).

[0015] In order to make this primary imprint perform, the high voltage (primary imprint voltage) is

impressed from DC power supply 3 to the middle imprint drum 2. 14 is a cleaner for removing the toner which remained in the photoconductor drum 10 surface.

[0016] In addition, for the object for yellow toners, and 12M and 13M, the object for cyanogen toners, and 12B and 13B of the object for Magenta toners, and 12C and 13C are [12Y and 13Y] for black toners among a photographic filter 12 and a development counter 13.

[0017] With a thickness of 1mm conductive rubber 2a is lined by the outside of aluminum element tube 2b by 1010 ohm-cm, it is formed, the imprint voltage (primary imprint voltage) of 800-1000 volts is impressed by DC power supply 3, and the rotation drive of the volume resistivity in which the middle imprint drum 2 is elastic is carried out to a photoconductor drum 10 and hard flow by the drive motor which is not illustrated.

[0018] Therefore, the peripheral face of the middle imprint drum 2 and the peripheral face of a photoconductor drum 10 move in this direction in the contact section, and a toner image is imprinted by the middle imprint drum 2 from a photoconductor drum 10 there (primary imprint). In addition, the volume resistivity of the middle imprint drum 2 is 108. The width of face of an omega-cm - 1012 ohm-cm degree is permitted.

[0019] The record form 100 is inserted between the middle imprint drum 2 and the imprint roller 17, and runs, a full color toner image is imprinted by the record form 100 from the middle imprint drum 2. (secondary imprint), and the record form 100 is further fixed to a full color toner image by the fixing assembly 16 there. In addition, the voltage of about 2000 volts is impressed as secondary imprint voltage.

[0020] 8 is the residual toner cleaner formed between the imprint section A to the record form 100, and the photoconductor drum 10 which imprints a new toner image to the middle imprint drum 2 next, in order to remove the residual toner which remained in the surface of the middle imprint drum 2 after imprinting a toner image to the record form 100.

[0021] Using such example equipment, primary imprint voltage was changed in 200-2200 volts, and imprint effectiveness was measured. "Imprint effectiveness" is the ratio of the amount of toners (mg/cm²) of the toner image imprinted by the middle imprint drum 2 to the amount of toners of the toner image formed in the photoconductor drum 10 (mg/cm²), i.e., the amount of toner imprints (mg/cm²) / the amount of toner development, (mg/cm²).

[0022] That experimental result was shown, since it was less than [1200V], that the imprint effectiveness of the primary amorous glance of the lowest layer directly imprinted by the middle imprint drum 2 has exceeded a secondary color and the imprint effectiveness of a Miyoshi amorous glance decided to perform a primary imprint in this range, and, as for drawing 3, it performed secondary imprint voltage in 1500-2400 volts.

[0023] In a secondary imprint, since imprint effectiveness is 100%, a secondary color and the Miyoshi color are prescribed by only primary imprint effectiveness, and the imprint effectiveness in the secondary imprint of a primary color changes. On the secondary imprint voltage shown previously, the imprint effectiveness of a primary amorous glance serves as 70 - 90% of range.

[0024] When the imprint effectiveness of the toner more finally than this imprinted on the record form 100 is searched for, and primary imprint voltage is 1000 volts, a primary amorous glance is [93%, a secondary color, and a Miyoshi amorous glance] 86%. Since a primary amorous glance was [90%, a secondary color, and a Miyoshi amorous glance] 100% when secondary imprint voltage was 2400 volts, it turns out that the comprehensive imprint effectiveness of a primary amorous glance is a secondary color and the imprint effectiveness in which a Miyoshi amorous glance is almost equivalent to 86%, 84%.

[0025] The range of primary imprint voltage [in / from these conditions / the middle imprint drum 2] is 1200 volts or less (however practically 600 volts or more), and the range of it is 800-1000 volts more desirably than imprint effectiveness. Thereby, it was checked that the color toner image established after the secondary imprint is a desired color.

[0026]

[Effect of the Invention] According to the color electrophotography equipment of this invention, without needing a special configuration, only the amount of toners of the toner image of the lowest layer imprinted by setup of imprint voltage on a middle imprint object can be made [many] compared with other layers, consequently the toner image of the lowest layer is

imprinted in the suitable predetermined amount of toners to a record medium as compared with other layers, and a good full color image can be obtained.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is principle drawing of this invention.

[Drawing 2] It is the whole example block diagram.

[Drawing 3] It is the diagram showing the experimental result of an example.

[Description of Notations]

1 Monochrome Toner Image Formation Means

2 Middle Imprint Drum (Middle Imprint Object)

3 DC Power Supply (Imprint Voltage Impression Means)

100 Record Form (Record Medium)

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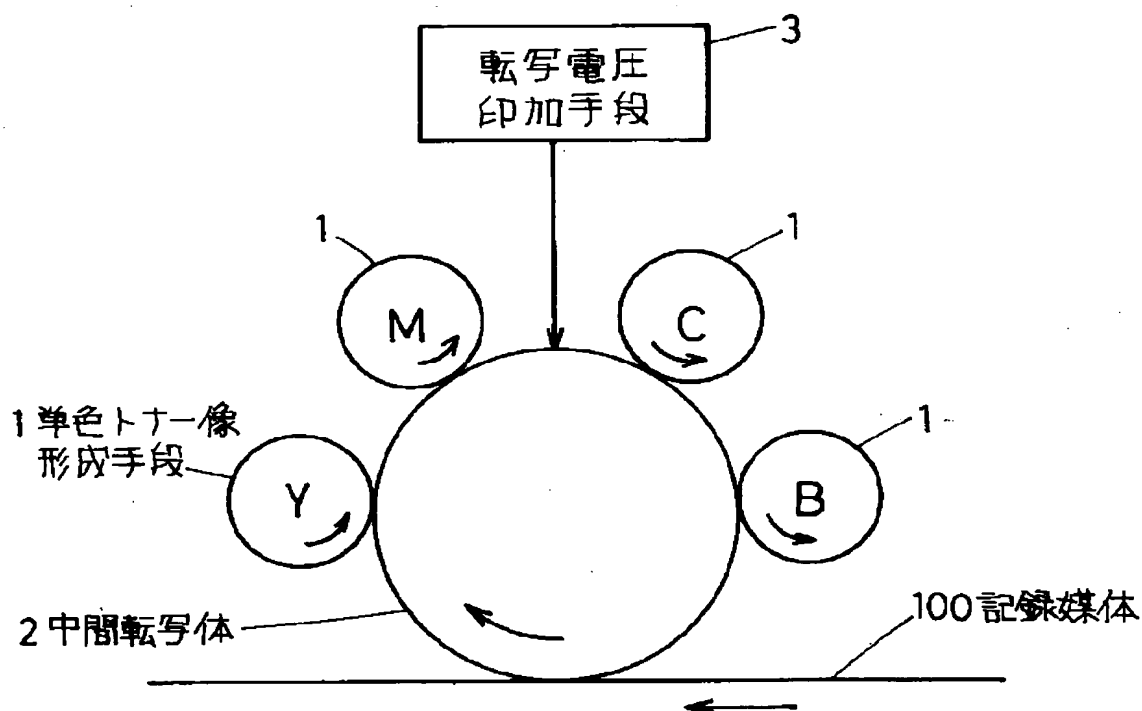
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DRAWINGS

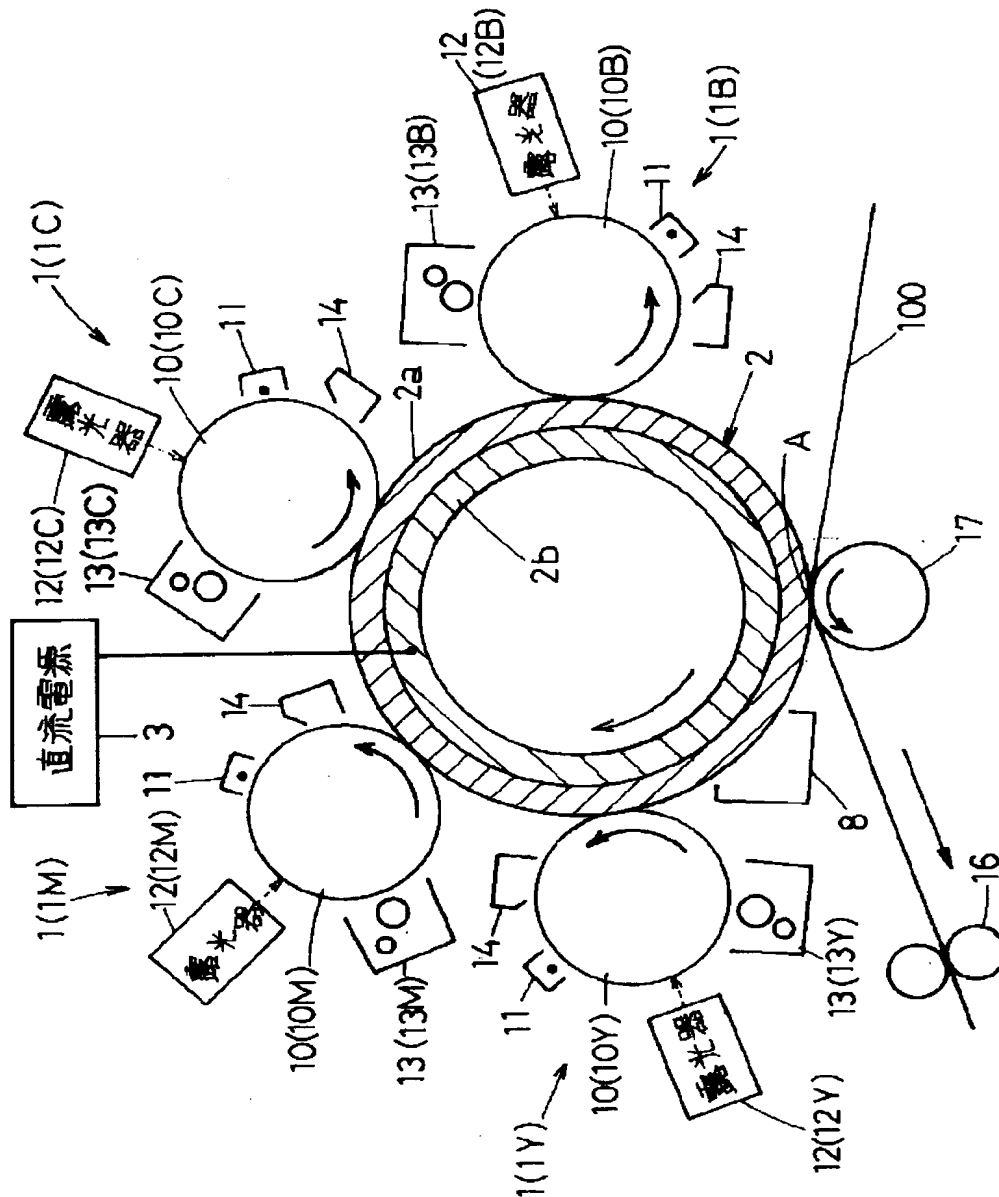
[Drawing 1]

本発明の原理図



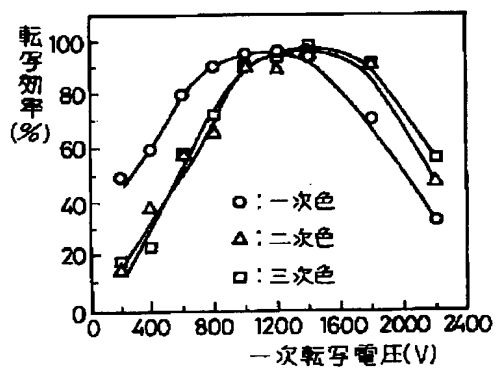
[Drawing 2]

実施例の全体構成図



[Drawing 3]

実施例の実験結果を示す線図



カラー画像を得ることができる。

【図面の簡単な説明】

【図1】本発明の原理図である。

【図2】実施例の全体構成図である。

【図3】実施例の実験結果を示す線図である。

【符号の説明】

1 単色トナー像形成手段

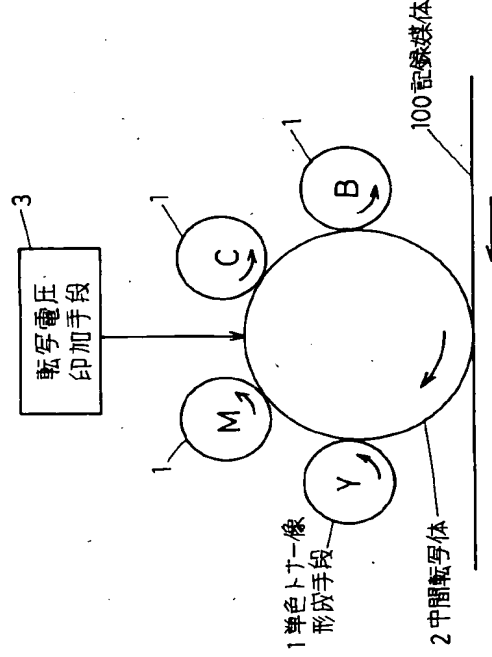
2 中間転写ドラム (中間転写体)

3 直流電源 (転写電圧印加手段)

10 100 記録用紙 (記録媒体)

【図1】

本発明の原理図



トの転写電圧 (一次転写電圧) が印加されており、図示されている電圧印加によって感光ドラム10の逆方向に回転駆動される。

【0018】したがって、中間転写ドラム2の外周面と感光ドラム10の外周面とは、接触部においては同方向に移動して、そこで感光ドラム10から中間転写ドラム2にトナー像が転写 (一次転写) される。なお、中間転写ドラム2の体積抵抗率は $108 \Omega \cdot \text{cm} \sim 10^{12} \Omega \cdot \text{cm}$ 程度の値が許容される。

10 【0019】記録用紙100は、中間転写ドラム2と転写ローラ17との間に挟まれて走行し、そこで、中間転写ドラム2から記録用紙100にフルカラートナー像が転写 (二次転写) され、さらに定着器16によって、フルカラートナー像が記録用紙100に定着される。なお、二次転写電圧として2000ボルト程度の電圧が印加される。

【0020】8は、記録用紙100へトナー像を転写した後、中間転写ドラム2の表面に残った残留トナーを除くために、記録用紙100への転写部Aと次に中間転写ドラム2に新しいトナー像を転写する感光ドラム10との間に設けられた残留トナークリーナである。

【0021】このような実施例装置を用いて、一次転写電圧を2000～2200ボルトの範囲で変化させて、転写効率を測定した。「転写効率」とは感光ドラム10に形成されたトナー像のトナー量 (mg/cm^2) に対する、中間転写ドラム2に転写されるトナー像のトナー量 (mg/cm^2) の比率、即ちトナー転写量 (mg/cm^2) / トナー現象量 (mg/cm^2) である。

【0022】図3はその実験結果を示しており、中間転写ドラム2に直接転写される最下層の一次色の転写効率は二次色及び三次色の転写効率を上回っているのは1200V以下であることから、この範囲で一次転写を行うこととし、二次転写電圧を1500～2400ボルトの範囲で行った。

【0023】二次転写においては、二次色及び三次色の転写効率が100%であるために一次転写効率のみで規定され、一次色の二次転写における転写効率が変化する。先に示した二次転写電圧では、一次色の転写効率は70～90%の範囲となる。

【0024】これより具体的に記録用紙100上に転写されるトナーの転写効率を求めると、一次転写電圧が1000ボルトの時は一次色が93%、二次色及び三次色が86%で、二次転写電圧が2400ボルトの時は一次色が90%、二次色及び三次色が100%であったことから、一次色の総合転写効率は84%、二次色及び三次色が86%とほぼ同等の転写効率となっていることが判る。

【0025】これらの条件より、中間転写ドラム2における一次転写電圧の範囲は1200ボルト以下 (ただし実用上600ボルト以上) で、転写効率より、望ましく

転写体2上で最下層になっても、最下層の単色トナー層は他の層に比べて高い転写効率で単色トナー像形成手段1からトナー像の転写を受ける。その結果、中間転写体2上では、常に最下層のトナー層だけが他の層に比較して過剰のトナー量となる。

【0010】したがって、次に中間転写体2から記録媒体100に転写される際には、最下層のトナーの一部が中間転写体2上に残ることによって、記録媒体100上において最下層のトナー量が、他の層と比較して適量量になる。

【0011】

【実施例】図面を参照して実施例を説明する。図2は、黄 (Y)、マゼンタ (M)、シアン (C) 及び黒 (B) の4色のトナーを用いたカラー電子写真装置を示している。

【0012】この装置は、4色のトナーによるトナー像を形成するための4つの単色トナー像形成手段1 (Y、M、C、B) と、各単色トナー像形成手段1に設けられた感光ドラム10 (10Y、10M、10C、10B) に同時に接触して回転駆動される中間転写ドラム2とを有している。

【0013】そして、下層側から黄 (Y)、マゼンタ (M)、シアン (C)、黒 (B) の順になるように、各感光ドラム10から各色のトナー像を中間転写ドラム2の外周面に重ね合わせて転写 (一次転写) した後、その外周面に重ね合わせて転写 (一次転写) を、中間転写ドラム2上から記録用紙100上に転写 (二次転写) するようにしている。したがって、記録用紙100上には、中間転写ドラム2上とは逆の順序で各色のトナー像が形成される。

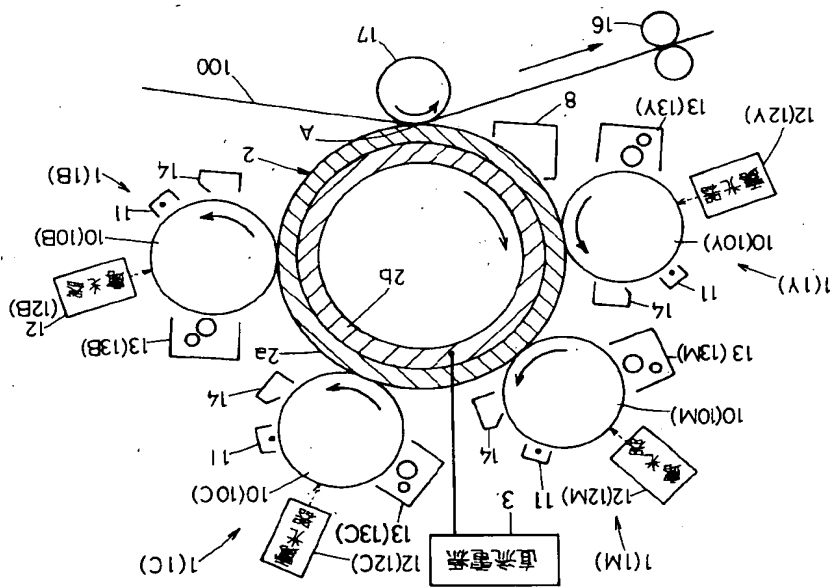
【0014】各感光ドラム10 (10Y、10M、10C、10B) の周囲には、感光ドラム10に帯電をさせるための前荷電器11、感光ドラム10に画像光を照射して静電潜像を形成する露光器12、静電潜像をトナーによって現像する現像器13が順次配列されており、中間転写ドラム2が感光ドラム10に接触することによって、感光ドラム10表面のトナー像が中間転写ドラム2に転写 (一次転写) される。

【0015】この一次転写を行わせるために、中間転写ドラム2に対して直流電源3から高電圧 (一次転写電圧) が印加されている。14は、感光ドラム10表面に残ったトナーを除くためのクリーナである。

【0016】なお、露光器12及び現像器13のうち、12Y及び13Yは黄色トナー用、12M及び13Mはマゼンタトナー用、12C及び13Cはシアントナー用、12B及び13Bは黒色トナー用のものである。

【0017】中間転写ドラム2は、例えば弾力性のある体積抵抗率が $10^{10} \Omega \cdot \text{cm}$ 程度、厚さ1mmの導電性ゴム2aがアルミニウム箔2bの外側にライニングされて形成されて直流電源3によって例えば800～1000ボルト

【図2】
実施例の全体構成図



【図3】

実施例の気象線図を示す概図

